SYNOPSIS
ULTRASONIC AND DIELECTRIC PROPERTIES OF SOME ORGANIC COMPOUNDS

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1) ***INTRODUCTION***

Dielectric properties of materials are important because these properties are related to the other physical properties such as moisture content and can be used for indirect sensing of such physical attributes of materials. They are also important because they affect the interaction of Electromagnetic energy with the materials.

Organic compounds of biological chemical and medical importance. Estimation of dielectric behavior is important for deciding their uses in different fields.

To predict the molecular interactions of organic compound are important therefore the study of binary system of the organic compounds is undertaken.

Ultrasonic velocity in a medium is fundamentally related to binding forces between the atoms and molecules, using these various parameters are to be calculated which helps for molecular interactions within the medium ultrasonic studio binary mixture is of considerable importance in research and industries.

2) ***REVIEW OF LITERATURE AND DEVELOPMENT IN THE SUBJECT***

Dielectric and ultrasonic study in liquid mixtures has extensive applications in understanding molecular structure and nature of molecular interaction. An excellent work has been done by many researchers for example, Beotil Jacobson said that in empirical relations that are sought between the intermolecular free length and the properties in liquids are dependent on intermolecular processes.

It has been shown that the properties such as Compressibility, Surface Tension and Viscosity can easily Be related to free length between surfaces of the molecules in a pure liquid or liquid mixtures.

Dielectric relaxation study of solute solvent mixture at microwave region gives information about molecular polarization in the system the complex permittivity spectra were studied by many researchers using Time Domain Reflectometric (TDR) technique.

3) ***OBJECTIVES OF RESEARCH / PROPOSED HYPOTHESIS***

We proposed to estimate dielectric ultrasonic and Related behavior of some organic compounds. A dielectric and ultrasonic parameter depends upon frequency, we will study at various frequencies from kilohertz to gigahertz. we shall measure and calculate the Dielectric Constant(ε'), Dielectric Loss (ε''), Loss Tangent (Tan δ), Relaxation Time (τ), Resistivity (ρ), Conductivity (σ), Viscosity, Dipole Moment (μ), Refractive Index, etc.

Acoustic parameters are measured from the values of density like Ultrasonic Velocity (U), Adiabatic Compressibility (β_{ad}), Intermolecular Free Length (L_f), Acoustic Impedance (Z) and Relative Association (R_A) of binary mixture with organic compounds.

4) ***METHODOLOGY TO BE ADOPTED***

a) ***ACOUSTIC PARAMETER***

Using basic physical properties of liquid like ultrasonic velocity, density, viscosity and surface tension many other physical parameters can be obtained such as Adiabatic Compressibility (β_{ad}), Intermolecular Free Length (L_f), Acoustic Impedance (Z), Relative Association (R_A)

$$\beta = -\frac{1}{v}\frac{dv}{dp} \quad \text{------(1)}$$

$$L_f = K(\beta_{ad})^{1/2} \quad \text{------(2)}$$

$$R_A = \frac{\delta_s}{\delta_0}\left(\frac{U_0}{U_s}\right)^{1/3} \quad \text{------(3)}$$

$$Ultrasonic\ velocity\ (U) = Frequency(f) \times wavelength(\lambda) \quad \text{------(4)}$$

b) ***DIELECTRIC PARAMETERS.***

The Reflectometric technique is used for measuring reflection coefficient from the dielectric boundary of the sample at microwave frequency. The J/X microwave bench is to be used. The sample is introduced in the sample holding dielectric cell and plunger is moved slowly to change the liquid column in the dielectric cell the maxima and minima are to be noted from standing wave pattern. From this dielectric wavelength (λ_d) has to be calculated. From λ_d measurement the various dielectric parameters are to be calculated by using following equations given in the literature.

$$\varepsilon' = \left(\frac{\lambda_0}{\lambda_c}\right)^2 + \left(\frac{\lambda_0}{\lambda_d}\right)^2 \quad \text{------(5)}$$

$$\varepsilon'' = \frac{2}{\Pi}\left(\frac{\lambda_0}{\lambda_c}\right)^2 \frac{\lambda_g}{\lambda_d}\left(\frac{d\rho}{dn}\right) \quad \text{------(6)}$$

$$\tau = \frac{\lambda_0}{2\Pi C}\left(\frac{dy}{dx}\right) \quad \text{------(7)}$$

$$\mu^2 = \frac{9KTM}{4\Pi Nd}\left[1 + \left(\frac{dy}{dx}\right)^2\right]\frac{dX}{dW} \quad \text{------(8)}$$

Where, ε' is dielectric constant, ε'' is the dielectric loss, τ is relaxation time and μ is the dipole moment.

5) ***IMPORTANCE OF STUDY / SOCIETY APPLICATION***

i) INTERNATIONAL STATUS:

Ultrasonic studies in organic liquids and their binary mixtures have been of considerable research interest during the last few decades. In the present scenario many insecticides and pesticides are proving, use less to kill harmful pests on the crops. Worldwide research has been taken to produce or search for an affective insecticides and pesticides. Also, the increasing numbers of packaged food industries worldwide are in search of good flavoring agents which are safe for health. Therefore, this study may result some useful information.

The syntheses of many drugs are carried out by pharmaceutical companies worldwide. During the synthesis compounds containing polar liquids plays an important role. The present study can help to the pharma sector also.

ii) NATIONAL STATUS:

Study of complex permittivity, relaxation of binary mixture of polar liquids with non-polar has been carried out by using TDR, FDR and impedance analyzer. The dielectric study of the material is carried out in almost all the Indian universities. Many research papers have been published by the researchers.

6) ***SIGNIFICANCE OF STUDY***

Dielectric relaxation of mixture gives meaningful information about molecular interaction system. The molecular structure and molecular interaction plays a vital role in the research and development of drugs, insecticides and pesticides, flavoring agent etc. The dielectric study polar liquids are important for understanding the hydrogen bonding and intermolecular interactions in the mixture. To exploit the benefit of such polar liquids the present work is undertaken.

After investigation of dielectric constant we can verify the purity of insecticides and pesticides and geometry of molecule. The study will be useful to verify the molecular interaction of newly synthesize.

7) ***PROPOSED WORKPLAN / FORMULATION AND STRUCTURE OF STUDY***

Year wise plan of work and target to be achieved.

First year

1. Collection of literature and verification of earlier work.
2. Study of related research paper on dielectric and acoustic behavior of polar liquids.
3. Selection of proper series of polar liquids.

Second year

1. Purchasing chemicals of standard grades.
2. Experimental work by using instruments like J/X-band microwave bench, ultrasonic Interferometer etc. to study the above parameters.
3. Calculation of dielectric and acoustic parameters.
4. Submission of Experimental work report.

Third year

1. Result and discussion on data.
2. Participation and presentation of research papers in International/ National conferences.
3. Publications of research papers in Referred journals.
4. Pre-via-voce presentation at research center.
5. Writing of thesis.

8) ***BIBLIOGRAPHY /REFERENCES***

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